KamLAND-Kamioka Liquid Scintillator Anti-Neutrino Detector

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KamLAND is the world's longest baseline reactor neutrino experiment, located in the Kamioka mine under Mt. Ikenoyama near Mozumi, Japan. The primary goal of KamLAND is a search for neutrino oscillations using Japanese and western Asian nuclear power reactors. Most of the reactor power is distributed between 140 and 200 miles from the mine site. An observed depletion in the neutrino flux and/or a spectral distortion is evidence supporting the conclusion that the Large-Mixing –Angle Solution (LMA) is the correct resolution to the Solar Neutrino Problem. KamLAND detects anti- neutrinos while solar experiments study neutrinos. The traditional and robust inverse beta-decay signal of a prompt positron followed by a delayed neutron capture allows KamLAND to detect the roughly two event a day reactor signal with very little background.

This was a busy year for KamLAND and for the Berkeley collaborators. Construction and installation of the 1839 inner detector phototubes was completed at the end of FY01. Following the installation of the 13-meter diameter scintillation fluid containing balloon filled with scintillation fluid and buffer oil began. Like PMT installation oil filling was carried out by the entire collaboration. The fill rate was limited by oil deliveries and it began in early winter and ended in late summer FY02.

Installation of the critical front end electronics produced by LBNL began in the fall. The Berkeley Z-axis calibration deployment system was installed in November. Official data taking began on January 22, 2002. The detector was commissioned with only the 17"-PMTs inner detector and the full outer detectro operating. US-provided refurbished 20" PMTs will be brought online as high-voltage power supplies become available. Power supplies are scope contingency as part of the US contribution to KamLAND.

Initial calibrations indicate that the photoelectron yield of the scintillator is larger than expected. Radiopurity of the KamLAND detector is found to exceed the requirements for the reactor neutrino phase. However, high radon levels presently limit the trigger threshold above the requirements for the 7Be solar neutrino phase of the experiment. Detector operations is improving as data taking continues.

Footnote.s and References

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1. http://www.awa.tohoku.ac.jp/html/KamLAND
2. J. Busenitz, et al., Proposal for the US participation in KamLAND", March 1999 unpublished.

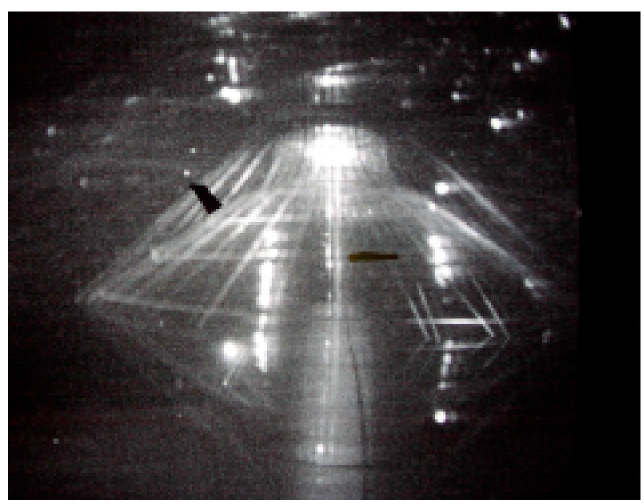

Fig. 1. A video camera monitored the interior of KamLAND. The balloon is visible during the final stages of the filling process.